

PROJECT ABSTRACT, BACKGROUND, AND SCOPE OF SERVICES:

DEVELOPMENT OF A PREDICTIVE BEHAVIORAL MODEL

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**CUSTOMER-CENTERED SERVICES AND ARREARAGE MANAGEMENT: AN EXPERIMENTAL
APPROACH TO SUPPORT PAYMENT CONSISTENCY AND ARREARAGE REDUCTION FOR
LOW-INCOME NON-CUSTODIAL PARENTS**

A Proposal Submitted to OCSE for
Section 1115 Funding

by

**DIVISION OF CHILD SUPPORT ENFORCEMENT
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PROJECT ABSTRACT, BACKGROUND, AND SCOPE OF SERVICES:

DEVELOPMENT OF A PREDICTIVE BEHAVIORAL MODEL

Project Abstract

The Virginia Division of Child Support Enforcement (DCSE) is proposing an intensive 36-month demonstration to learn more about strategies and resources that help low-income non-custodial parents (NCPs) who either owe arrears or are likely to accumulate them. The project has three (3) goals: (1) to develop and implement procedures and methods valued by customers that result in consistent payments and avoidance of arrears; (2) to prepare, validate, and implement an instrument to classify the risk of NCPs falling into arrearages, which instrument can be used by Establishment staff at Intake and by Enforcement staff on an ongoing basis to identify at-risk NCPs, and then take appropriate actions to prevent such arrearages; and (3) to arrange negotiations with NCPs on both TANF and Non-TANF cases to settle arrearages and provide for consistent payments on current support.

Seven objectives include: A 20 percent reduction in the time required to establish paternity; establish support obligations viewed as equitable by both CPs and NCPs and that result in consistent payments; train enforcement staff who are viewed as customer-oriented by both CPs and NCPs; establish an arrearages prediction model useful to staff in constructively enforcing cases involving low-income NCPs; reduce arrearages in Arrears Only cases by 10 percent and arrearages in Arrears plus Current Support cases by 15 percent; increase the consistency in the NCP mean payment amount and payment frequency by 15 percent; and reduce the rate of accumulated arrearages in new cases for low-income NCPs by 15 percent.

We expect the results to affect policy, procedures, federal incentive measures, and staff and NCPs alike. Both a Data Collection Plan and an Evaluation Plan are included, with most proposed staff familiar to DCSE and its research program.

PROJECT ABSTRACT, BACKGROUND, AND SCOPE OF SERVICES:

DEVELOPMENT OF A PREDICTIVE BEHAVIORAL MODEL

I. BACKGROUND (*material directly relevant to Goal/Experiment 2, the predictive model, is in bold*)

Problems/Issues Requiring Solution

National research, national performance statistics and research of performance in Virginia show that more effective strategies are needed to establish support orders and manage active cases involving low-income non-custodial parents (NCPs) to ensure their children receive the current support they are due. For example, in Virginia alone in Fiscal Year 2000, only 50% of current support was collected.¹ Among the major reasons for this low percentage is the large portion of NCPs who do not earn sufficient income to make required payments. For example, approximately 38 percent of all NCPs in Virginia are unemployed. These unemployed NCPs and others, who may be employed in subsistence-level jobs, represent a large percentage of the NCPs who incur arrearages because they do not have the financial means to pay current support. For example, as noted above, 38% of all NCPs are unemployed, but 43.6% of the NCPs who owe arrearages are unemployed.² Furthermore, unemployed NCPs owe 51.7% of the total arrearages in the Division of Child Support Enforcement (DCSE) caseload.

In sum, “low-income” NCPs, who have employment records characterized by many changes in employers, either working in minimum wage jobs or periodically unemployed, have the most difficulty paying current support and avoiding arrearages. The prospects of making payments on arrearages are also much less for low-income NCPs. For example, in a DCSE study of NCPs who owed arrears, 79.7% of NCPs who were employed made a payment (for either current support or arrearages) within a 12-month period; 55.2% of unemployed NCPs made a payment in the same period. Arrearages not only deprive children of the financial support needed in the past for their growth and development, but they also adversely affect the motivation of an NCP’s making payments needed for current support. Clearly, strategies are needed so “low-income” NCPs will make current support payments and, thus, avoid arrearages. In addition, where arrearages exist, strategies are needed to resolve them in a manner equitable to the CPs, NCPs, their children, and the state.

Strategies that have a high probability of achieving success in current support payments for “low-income” NCPs are these:

- Improved services to these NCPs.
- **Using a prediction model to optimize enforcement actions.**

¹ Joint Legislative Audit and Review Commission, *Final Report: Child Support Enforcement*, 2001, p. 15.

² Based on the results of a random sample of 6,653 cases in which NCPs owed arrears only or arrears plus current support. See *Developing New Approaches to Collecting Arrears: The Virginia Experience*, Commonwealth of Virginia, Division of Child Support Enforcement, *forthcoming*.

- Using professional negotiation services to resolve some of the NCP's arrearages.

Avoiding Arrearages: Optimizing Enforcement Using an Arrearages Prediction Model

Enforcement methods may also contribute to the problem of arrearages. Some NCPs complain that child support enforcement personnel treat them as adversaries.³ Another problem is using a “one shoe fits all” approach to enforcing cases. Most child support enforcement agencies have excessively large and ever-growing caseloads. Applying the same enforcement approach to all NCPs is a waste of scarce resources. One reason for this situation is that neither Establishment nor Enforcement personnel have an instrument (or tool) to predict the likelihood of an NCP incurring arrearages. Such a tool could help Establishment and Enforcement personnel decide which interventions and enforcement actions, respectively, depending upon the arrearage profile for that NCP, to use in an NCP's case. This profile, when used in conjunction with other indicators like feedback from the NCP during formal periodic communication sessions, could assist Enforcement personnel in more effectively allocating their time. True, NCPs have a responsibility to meet their support obligations. Nevertheless, while all required enforcement actions will be taken to ensure that this is accomplished, the predictive tool proposed for development and testing in this research would significantly benefit Establishment and Enforcement staff in their work.

Framework for Research

Arrearages Neural Network (or Similar Predictive) Model

An Arrearages Neural Network (or similar behavioral predictive) Model (ANNM, for short) will be developed using new and/or existing clients of DCSE. At the outset, when a new case is established, data elements will be collected for six (6) months to establish a behavioral profile for the individual NCPs in the study sample. These data include: credit, employment, income and criminal histories; demographic profiles; and CSE case information. Over the subsequent 12 months, case level data on dependent variables will be collected such as monthly balance, enforcement actions, and changes to case information.⁴

At the end of the 18 months, the ANNM or other behavioral predictive model will be used to classify new NCPs who are at risk of falling into arrears. In addition, the ANNM or similar model will be able to incorporate changes in case status to identify at-risk NCPs on an ongoing basis.

Recently, researchers with the Washington Division of Child Support (WDSCS) prepared a neural network prediction model to predict child support arrearages. Their model was able to make predictions of arrearages for 60 percent of a “general group of

³ Ibid., p. 47.

⁴ The evaluation section of this proposal includes a table (#3, p. 10), with three primary evaluation questions, the variables to be addressed, hypotheses, and hypothesis tests for Experiment 2.

NCPs” and “up to 75% of the predictions will be correct.”⁵ The behavioral model proposed here will make predictions on a dynamic basis. That is, as information pertaining to NCPs is updated, such as frequency and amount of payments and enforcement actions taken, the model will revise its predictions of the risk that each NCP will incur arrearages.

Researchers involved in preparing the WDCS model will be contacted for that model’s relevance to the behavioral prediction model proposed in this research. Topics to be explored include the approach used, any software employed, and independent and dependent variables accounted for in the WDCS model. Of interest to us, also, is how the WDCS enforcement workers used predictions from the model in their case management and decision-making.

Project Goals and Objectives

The three goals in this research are:

- Develop and implement procedures and methods valued by customers that result in consistent payments and avoidance of arrears
- **Prepare, validate and implement an instrument to classify the risk of NCPs falling into arrearages, which instrument can be used by Establishment staff at Intake and by Enforcement staff on an on-going basis to identify at-risk NCPs**
- Arrange negotiation processes with NCPs on both TANF and NTANF cases to settle arrearages and provide for consistent payments on current support.

The principal objectives are to:

- Achieve a 20 percent reduction in the time required to establish paternity
- Establish support obligations that are viewed as equitable by both CPs and NCPs and that result in consistent payments
- Train enforcement staff to be viewed by both CPs and NCPs as customer-oriented
- **Establish an arrearages prediction instrument that is viewed as helpful by child support staff in establishing and enforcing cases and, also, results in reductions in arrearages**
- Reduce arrearages in Arrears Only cases by 10 percent and arrearages in Arrears plus Current Support cases by 15 percent
- Increase the consistency in NCP’s mean payment amount and payment frequency by 15 percent
- Reduce the rate of arrearages accumulations in new cases by 15 percent.

II. PROJECT APPROACH AND THEORETICAL FRAMEWORK *(material directly relevant to Goal/Experiment 2, the predictive model, is in bold)*

⁵*Determining the Composition and Collectibility of Child Support Arrearages*, MAPS Unit, Division of Child Support, Washington State DSHS, April 2002, p. 3.

The theoretical framework for this research is shown in Table 1, below. It involves three experiments with three treatments in Experiment 1, **a single treatment in Experiment 2 (three phases: model development, model testing, and model field-testing)** and three treatments in Experiment 3. Table 1 also shows the number of subjects who will be randomly assigned to the experimental and control groups, as well as the research questions and hypotheses to be tested, and identifies the methods to be used to test the hypotheses.

Table 1
THEORETICAL FRAMEWORK FOR RESEARCH PROJECT

Experiments/Treatments	# Subjects Randomly Assigned		# Research Questions	# Hypotheses	Method of Hypothesis Testing
	Control	Experimental			
Experiment 1					
Treatment 1	318	318	9	9	For all 3 treatments, ANOVA & Chi Square, as appropriate
Treatment 2	318	318	2	4	
Treatment 3	318	318	11	13	
Experiment 2					
Model development		900	none	none	none none ANOVA and Chi Square, as approp.
Model testing		900	none	none	
Model field-testing	318	450	3	3	
Experiment 3					
Treatment 1	900	900	3	3	ANOVA for all 3 treatments
Treatment 2	900	900	3	3	
Treatment 3	900	900	3	3	

III. SCOPE OF SERVICES

Experiment 2: Preparation, Validation, and Implementation of an Intake Instrument to Predict an NCP's Risk of Incurring Arrearages

Data will be collected for 900 NCPs in the first six months of the study, as outlined below. Performance data such as payments made and arrearages accrued will also be collected for the 900 NCPs for an additional 12 months. At the end of this 18-month period, a predictive payments-behavior model will be developed. The predictive model will categorize NCPs with new cases into one of three categories: “high risk” for incurring arrearages; “medium risk” for incurring arrearages; and “low risk” for incurring arrearages. Next, the payments-behavior model will be tested on an additional 900 NCPs with new cases, and refined as appropriate. Finally, the model will be field-tested for 12 months: Project staff in the experimental offices will be trained to use it and will begin considering its predictions in making decisions about appropriate establishment and enforcement actions. At the conclusion of the 12-month field trial, the model will be evaluated by comparing the payment history and arrearages of the NCPs in the experimental and control groups. Project staff will also be asked to assess their

experience with the model, including their recommendations for changes and improvements. As necessary, additional modifications will be made to the model.

The tasks involved in Experiment 2 are listed below, followed in parentheses by the team responsible for the task (Legend: E = Evaluator, TC = Technical Consultant, and MD = Model Developer):

- Task 1: Review simulation work by Washington Division of Child Support (WDCS); discuss this research with principal investigator, including how the model is used for decision-making. **(Evaluator)**
- Task 2: Conduct focus groups of DCSE staff to identify characteristics of NCPs associated with these risk categories of arrears: Low Risk; Medium Risk; and High Risk. **(Lead: TC; Assist: MD)**
- Task 3: Develop an Intake Assessment Form with the characteristics identified in Task 2. **(Lead: E; Assist: MD)**
- Task 4: Define data and data sources needed for model, including:
 - Demographic variables (such as income and employment history).
 - Other personal data (such as incarceration data, credit agency information, and related). **(Lead: MD; Assist: TC & E)**
- Task 5: Prepare ANNM Data Collection Form for use by project staff containing the data fields of information to be collected from new NCPs. **(Lead: TC; Assist: MD)**
- Task 6A: Define data for dependent variables to be obtained from APECS, such as:
 - Payment as a percent of support amount.
 - Frequency of payment.
 - Arrears incurred. **(Lead: MD; Assist: TC & E)**
- Task 6B: Determine most appropriate predictive model to use. **(Lead: MD; Assist: TC & E)**
- Task 7: Prepare spreadsheets for recording information from the ANNM Data Collection Form, Intake Assessment Form and APECS. **(Lead: MD; Assist: TC & E)**
- Task 8: Train project staff on collecting information using the ANNM Data Collection Form, the Intake Assessment Form, obtaining payment information from APECS and recording this information on the spreadsheets. **(Lead: TC)**
- Task 9: Project staff interview NCPs and collect and record information in Task 6 and manage the cases in the usual manner. **(Lead: CSE Specialists)**
- Task 10: Input NCP information from spreadsheets into neural network software. **(Lead: MD)**
- Task 11: Prepare initial model. **(Lead: MD)**
- Task 12: Test the model with an additional sample of new NCPs. **(Lead: MD)**
- Task 13: Prepare final model. **(Lead: MD)**

- Task 14: Train project staff how to use the model predictions in decision-making; for example, in taking enforcement actions. **(Lead: TC; Assist: MD)**
- Task 15: Conduct evaluation of training in Task 14. **(Lead: E)**
- Task 16: Randomly select NCPs for experimental and control groups to field test the model. **(Lead: E)**
- Task 17: Project staff interview, record and input information for NCPs in the experimental group and use their training in the ANNM in making decisions affecting the case. **(Lead: CSE Specialists)**
- Task 18: Project staff who have NCPs in the control group collect information on the dependent variables and input in spreadsheets and manage the cases according to customary practice. **(Lead: CSE Specialists)**
- Task 19: Conduct statistical testing of differences in the NCPs in the experimental and control groups for the dependent variables. **(Lead: E)**
- Task 20: Prepare ANNM Assessment Form. **(Lead: E)**
- Task 21: Conduct opinion surveys using the ANNM Assessment Form of project staff involved in the experimental group concerning the various aspects of the ANNM, such as its effectiveness, ease of use and suggestions for changes. **(Lead: E)**
- Task 22: Conduct evaluation of ANNM opinion survey. **(Lead: E)**

Unique Features: Many organizations use models to predict human behavior in areas such as debt repayment. A model predicting the probability of incurring arrearages would help child support staff set priorities for their casework and use enforcement tools more effectively. The goal of this research will be to develop a model with predictive power that can materially assist child support staff to prevent arrears on new cases and to increase the rate of consistent payments on existing cases, by focusing services and interventions such as job search, counseling, and enforcement actions on those NCPs who need them.

Time Line and Staffing

Table 2 (pages 7-8) contains a time line for completion of the tasks outlined for Experiment 2. The first column shows the Experiment, Treatment, and Task -- corresponding to the first, second and third digits, respectively. For example, 2.0.1 means Experiment 2, (Single Treatment), Task 1. The other column headings are months for the respective years in the study. Cell entries denote which project staff will be conducting the work. Staff coding is as follows:

E = Evaluation (E) staff

M = Model Development (M) staff

S = Support Enforcement Specialists

T = Technical Consultant (T) staff.

Table 2
TASK TIME LINE AND STAFFING PLAN

Task ¹	Year 1												Year 2												Year 3												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
1.1.1	E,T	M*																																			
2	E																																				
3			T																																		
4				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
5				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
6				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
7				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
8				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
9		E	E																																		
10				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
11		T	T																																		
12				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
13				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
14				E																																	
15				E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		
16				E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		
17				E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		
1.2.1			T	T	T	T																															
2						T	T	T	T																												
3						T	T	T	T																												
4										T																											
5											T																										
6												E																									
1.3.0 ²																																					
2.0.1 ³	E																																				
2	T	M																																			
3		E	M																																		
4	M	T,E																																			
5		T	M																																		

¹ First digit is the Experiment, second digit is the Treatment, and third digit is the Task. Thus, 1.1.1 = Experiment 1, Treatment 1, Task 1.

² Same timetable as Treatments 1 and 2 in Experiment 1 since Treatment 3 incorporates Treatments 1 and 2.

³ No treatments in Experiment 2.

* **Task 1.1.1 in Table 2 (i.e., Experiment 1, Treatment 1, Task 1) = “Prepare an Intake Assessment Form for use in identifying areas in which assistance is needed, and the Financial Planning and Budgeting Worksheet. [Lead: Evaluator, Technical Consultant; Assist: Model Developer]”**

Table 2 (cont.)

Task ¹	Year 1												Year 2												Year 3												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
2.0.6 ²	M	T,E																																			
7		M	T,E																																		
8			T																																		
9			S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		
10																M																					
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16																					E	E	E	E	E	E	E	E	E	E	E	E	E	E			
17																					S	S	S	S	S	S	S	S	S	S	S	S	S	S			
18																					S	S	S	S	S	S	S	S	S	S	S	S	S	S			
19																																			E		
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21																																			E		
22																																			E		
3.1.1				T	T	T																															
2							E																														
3								T																													
4									S	S	S	S	S	S	S	S	S	S	S	S	S	S															
5									E																												
3.2.1				T	T	T																															
2							E																														
3								T																													
4									S	S	S	S	S	S	S	S	S	S	S	S	S	S															
5									E																												
3.3.1				T	T	T																															
2							E																														
3								T																													
4									S	S	S	S	S	S	S	S	S	S	S	S	S	S															
5									E																												

¹ First digit is the Experiment, second digit is the Treatment, and third digit is the Task. Thus, 1.1.1 = Experiment 1, Treatment 1, Task 1.

² No treatments in Experiment 2.

IV. RESULTS OR BENEFITS EXPECTED: Predicting NCP Arrearages

As noted elsewhere, enforcement staff have ever-increasing caseloads. One answer to this predicament is to develop a practical instrument that frontline staff can use to consider what enforcement actions to take in specific cases. Presumably, closer case management could be given those NCPs who are predicted to have the highest probability of incurring arrears. If such a prediction model is valid and practical, there should be an increase in current payments with a corresponding reduction in arrears when enforcement staff use this model in their decision-making. We will test this proposition, first, by determining the predictive power of the instrument, comparing predictions of NCP arrearages in the control and the experimental groups. Also, we will analyze case history events to determine if the model was effective in guiding enforcement staff's decision-making. In addition, we will analyze the opinions of enforcement staff about the relative helpfulness of the model in predicting arrearages and supporting productive enforcement actions. Where possible, we will state the differences in monetary terms.

V. EVALUATION: Criteria Measuring Success

Table 3, Evaluation Plan: Experiment 2 (page 10), contains the research questions, the variables to be used to evaluate various components, the hypotheses to be tested, and the methods used to test the hypotheses for Experiment 2.

Table 3
EVALUATION PLAN: EXPERIMENT 2

Evaluation Question	Variable(s)	Hypotheses	Hypotheses Testing
Experiment 2: Arrears Neural Network (or similar predictive) Model (ANNM)			
l. ANNM was effective in classifying NCPs who are at risk of falling into arrears.	Accuracy in predictions	H27: No significant difference in the predicted and actual groups	Hypothesis 27 will be tested with a chi-square test.
m. ANNUM was effective in preventing or reducing arrearages.	NCP's arrearages on APECS records	H28: There is no significant difference among the control and experimental groups in the amount of arrearages.	Hypotheses 28 will be tested with an analysis of variance.
n. ANNUM was helpful to project staff in the experimental group.	Opinion survey (Likert Scale)	H29: There is no significant difference in the predicted and actual opinions among project staff in the experimental group.	Hypothesis 29 will be tested with a chi-square test.

Random Assignment of Subjects

Table 4 (page 10) shows the numbers of subjects and their random assignment by office, for the three offices participating in the project. All subjects will be randomly selected for the experimental, control, and treatment groups.

Table 4
ASSIGNMENT OF SUBJECTS TO CONTROL/EXPERIMENTAL GROUPS

District Office	New Cases							No. of Randomly Assigned Cases With Arrearages			
	New Cases/Mo. (estimated)	TANF/NTANF Ratio	No. of Randomly Assigned Cases								
			Control	ANNM	Customer-Centered Services Treatment			Control	Arrearages Negotiation Treatment		
					#1	#2	#3		#1	#2	#3
Norfolk	178	32%/68%	26	75	26	26	26	75	75	75	75
Petersburg	124	34%/66%	18	50	18	18	18	50	50	50	50
Portsmouth	60	30%/70%	9	25	9	9	9	25	25	25	25
Total/Mo.	362		53	150	53	53	53	150	150	150	150
6 mo.	2,172		318	900	318	318	318	900	900	900	900

